Appendix E

Definitions

Accuracy - The degree of conformance between the estimated or measured position and/or velocity of a platform at a given time and its true position or velocity. Radionavigation system accuracy is usually presented as a statistical measure of system error and is specified as:

- Predictable - The accuracy of a radionavigation system's position solution with respect to the charted solution. Both the position solution and the chart must be based upon the same geodetic datum. (Note: Appendix B discusses chart reference systems and the risks inherent in using charts in conjunction with radionavigation systems.)
- Repeatable - The accuracy with which a user can return to a position whose coordinates have been measured at a previous time with the same navigation system.
- Relative - The accuracy with which a user can measure position relative to that of another user of the same navigation system at the same time.

Air Traffic Control (ATC) - A service operated by appropriate authority to promote the safe and efficient flow of air traffic.

Approach Reference Datum - A point at a specified height above the runway centerline and the threshold. The height of the MLS approach reference datum is 15 meters (50 ft). A tolerance of plus 3 meters (10 ft) is permitted.

Area Navigation (RNAV) - Application of the navigation process providing the capability to establish and maintain a flight path on any arbitrarily chosen course that remains within the coverage area of navigation sources being used.

Automatic Dependent Surveillance (ADS) - A function in which aircraft transmit position and altitude data derived from onboard systems via a datalink for use by air traffic control, other aircraft, and certain airport surface vehicles.

Availability - The availability of a navigation system is the percentage of time that the services of the system are usable. Availability is an indication of the ability of the system to provide usable service within the specified coverage area. Signal availability is the percentage of time that navigation signals transmitted from external sources are available for use. Availability is a function of both the physical characteristics of the environment and the technical capabilities of the transmitter facilities.

Block II/IIA - The satellites that form the initial GPS constellation at FOC.

Cellular Triangulation - A method of location determination using the cellular phone system where the control channel signals from a mobile phone are captured by two or more fixed base stations and processed according to an algorithm to determine the location of the mobile receiver.

Circular Error Probable (CEP) - In a circular normal distribution (the magnitudes of the two one-dimensional input errors are equal and the angle of cut is 90o), circular error probable is the radius of the circle containing 50 percent of the individual measurements being made, or the radius of the circle inside of which there is a 50 percent probability of being located.

Coastal Confluence Zone (CCZ) - Harbor entrance to 50 nautical miles offshore or the edge of the continental shelf (100 fathom curve), whichever is greater.

Common-use Systems - Systems used by both civil and military sectors.

Conterminous U.S. - Forty-eight adjoining states and the District of Columbia.

Continuity - The continuity of a system is the ability of the total system (comprising all elements necessary to maintain aircraft position within the defined airspace) to perform its function without interruption during the intended operation. More specifically, continuity is the probability that the specified system performance will be maintained for the duration of a phase of operation, presuming that the system was available at the beginning of that phase of operation.

Coordinate Conversion - The conversion of position coordinates from one type to another within the same datum or geodetic reference system, e.g., from geodetic coordinates (latitudes and longitudes) to Universal Transverse Mercator (UTM) system (x,y).

Coordinated Universal Time (UTC) - UTC, an atomic time scale, is the basis for civil time. It is occasionally adjusted by one-second increments to ensure that the difference

between the uniform time scale, defined by atomic clocks, does not differ from the earth's rotation by more than 0.9 seconds.

Coverage - The coverage provided by a radionavigation system is that surface area or space volume in which the signals are adequate to permit the user to determine position to a specified level of accuracy. Coverage is influenced by system geometry, signal power levels, receiver sensitivity, atmospheric noise conditions, and other factors which affect signal availability.

Datum Transformation - The change of position coordinates from one geodetic datum or reference system to another datum or reference system, e.g., from European Datum 1950 to WGS 84.

Deception (electromagnetic) - Deliberate radiation, reradiation, alternation, suppression, absorption, denial, enhancement, or reflection of electromagnetic spectrum in any manner intended to convey misleading information.

Differential - A technique used to improve radionavigation system accuracy by determining positioning error at a known location and subsequently transmitting the determined error, or corrective factors, to users of the same radionavigation system, operating in the same area.

Distance Root Mean Square (drms) - The root-mean-square value of the distances from the true location point of the position fixes in a collection of measurements. As used in this document, 2 drms is the radius of a circle that contains at least 95 percent of all possible fixes that can be obtained with a system at any one place. Actually, the percentage of fixes contained within 2 drms varies between approximately 95.5 percent and 98.2 percent, depending on the degree of ellipticity of the error distribution.

En Route - A phase of navigation covering operations between a point of departure and termination of a mission. For airborne missions the en route phase of navigation has two subcategories, en route domestic and en route oceanic.

En Route Domestic - The phase of flight between departure and arrival terminal phases, with departure and arrival points within the conterminous United States.

En Route Oceanic - The phase of flight between the departure and arrival terminal phases, with an extended flight path over an ocean.

Fault Detection and Exclusion (FDE) - Fault detection and exclusion is a receiver processing scheme that autonomously provides integrity monitoring for the position solution, using redundant range measurements. The FDE consists of two distinct parts: fault detection and fault exclusion. The fault detection part detects the presence of an unacceptably large position error for a given mode of flight. Upon the detection, fault exclusion follows and excludes the source of the unacceptably large position error, thereby allowing navigation to return to normal performance without an interruption in service.

Flight Technical Error (FTE) - The contribution of the pilot in using the presented information to control aircraft position.

Free Flight - A safe and efficient flight operating capability under instrument flight rules in which the operators have the freedom to select their path and speed in real time. Air traffic restrictions are only imposed to ensure separation, to preclude exceeding airport capacity, to prevent unauthorized flight through special use airspace, and to ensure safety of flight. Restrictions are limited in extent and duration to correct the identified problem.

Full Operational Capability (FOC) - A system dependent state which occurs when the particular system is able to provide all of the services for which it was designed.

Geocentric - Relative to the Earth as a center, measured from the center of mass of the Earth.

Geodesy - The science related to the determination of the size and shape of the Earth by such direct measurements as triangulation, GPS positioning, leveling, and gravimetric observations.

Geometric Dilution Of Precision (GDOP) - All geometric factors that degrade the accuracy of position fixes derived from externally-referenced navigation systems.

Global Navigation Satellite System (GNSS) - The GNSS is a world-wide position and time determination system, that includes one or more satellite constellations, aircraft receivers, and system integrity monitoring, augmented as necessary to support the required navigation performance for the actual phase of operation.

Inclination - One of the orbital elements (parameters) that specifies the orientation of an orbit. Inclination is the angle between the orbital plane and a reference plane, the plane of the celestial equator for geocentric orbits and the ecliptic for heliocentric orbits.

Initial Operational Capability (IOC) - A system dependent state which occurs when the particular system is able to provide a predetermined subset of the services for which it was designed.

Integrity - Integrity is the ability of a system to provide timely warnings to users when the system should not be used for navigation.

Interference (electromagnetic) - Any electromagnetic disturbance that interrupts, obstructs, or otherwise degrades or limits the performance of user equipment.

Intrusion (electromagnetic) - Intentional insertion of electromagnetic energy into transmission paths with the objective to deceive or confuse the user.

Jamming (electromagnetic) - The deliberate radiation, reradiation, or reflection of electromagnetic energy for the purpose of preventing or reducing the effective use of a signal.

Multipath - The propagation phenomenon that results in signals reaching the receiving antenna by two or more paths. When two or more signals arrive simultaneously, wave interference results. The received signal fades if the wave interference is time varying or if one of the terminals is in motion.

Nanosecond (ns) - One billionth of a second.

National Airspace System (NAS) - The NAS includes U.S. airspace; air navigation facilities, equipment and services; airports or landing areas; aeronautical charts, information and service; rules, regulations and procedures; technical information; and labor and material used to control and/or manage flight activities in airspace under the jurisdiction of the U.S. System components shared jointly with the military are included.

National Command Authority (NCA) - The NCA is the President or the Secretary of Defense, with the approval of the President. The term NCA is used to signify constitutional authority to direct the Armed Forces in their execution of military action. Both movement of troops and execution of military action must be directed by the NCA; by law, no one else in the chain of command has the authority to take such action.

Nautical Mile (nm) - A unit of distance used principally in navigation. The International Nautical Mile is 1,852 meters long.

Navigation - The process of planning, recording, and controlling the movement of a craft or vehicle from one place to another.

Navigation System Error (NSE) - The NSE is the error attributable to the navigation system in use. It includes the navigation sensor error, receiver error, and path definition error. NSE combines with Flight Technical Error (FTE) to produce the Total System Error.

Nonprecision Approach - A standard instrument approach procedure in which no electronic glide slope is provided (e.g., VOR, TACAN, Loran-C, or NDB).

Position Dilution of Precision - A scalar measure representing the contribution of the GPS satellite configuration geometry to the accuracy in three-dimensional position.

Precise Time - A time requirement accurate to within 10 milliseconds.

Precision Approach - A standard instrument approach procedure using a ground-based system in which an electronic glide slope is provided (e.g., ILS).

Primary Means Air Navigation System - A navigation system approved for a given operation or phase of flight that must meet accuracy and integrity requirements, but need not meet full availability and continuity of service requirements. Safety is achieved by limiting flights to specific time periods and through appropriate procedural restrictions. There is no requirement to have a sole-means navigation system on board to support a primary-means system.

Radiodetermination - The determination of position, or the obtaining of information relating to positions, by means of the propagation properties of radio waves.

Radiolocation - Radiodetermination used for purposes other than those of radionavigation.

Radionavigation - The determination of position, or the obtaining of information relating to position, for the purposes of navigation by means of the propagation properties of radio waves.

Receiver Autonomous Integrity Monitoring (RAIM) - A technique whereby a GPS receiver/processor determines the integrity of the GPS navigation signals without reference to external systems other than to the GPS satellite signals themselves or to an independent input of altitude information. This determination is achieved by a consistency check among redundant pseudorange measurements.

Reliability - The probability of performing a specified function without failure under given conditions for a specified period of time.

Required Navigation Performance - A statement of the navigation performance accuracy necessary for operation within a defined airspace, including the operating parameters of the navigation systems used within that airspace.

RHO (Ranging Mode) - A mode of operation of a radionavigation system in which the times for the radio signals to travel from each transmitting station to the receiver are measured rather than their differences (as in the hyperbolic mode).

Roadside Beacons - A system using infrared or radio waves to communicate between transceivers placed at roadsides and the in-vehicle transceivers for navigation and route guidance functions.

Sigma - See Standard Deviation.

Sole Means Air Navigation System - A sole-means navigation system approved for a given operation or phase of flight must allow the aircraft to meet, for that operation or phase of flight, all four navigation system performance requirements: accuracy, integrity, availability, and continuity of service. Note--This definition does not exclude the carriage of other navigation systems. Any sole-means navigation system could include one (stand-alone installation) or several sensors, possibly of different types (multi-sensor installation).

Spherical Error Probable (SEP) - The radius of a sphere within which there is a 50 percent probability of locating a point or being located. SEP is the three-dimensional analogue of CEP.

Standard Deviation (sigma) - A measure of the dispersion of random errors about the mean value. If a large number of measurements or observations of the same quantity are made, the standard deviation is the square root of the sum of the squares of deviations from the mean value divided by the number of observations less one.

Statute Mile - A unit of distance on land in English-speaking countries equal to 5,280 feet or 1,760 yards.

Supplemental Air Navigation System - A navigation system that may only be used in conjunction with a primary- or sole-means navigation system. Approval for supplemental means for a given phase of flight requires that a primary-means navigation system for that phase of flight must also be on board. Amongst the navigation system performance requirements for a given operation or phase of flight, a supplemental-means navigation system must meet the accuracy and integrity requirements for that operation or phase of flight; there is no requirement to meet availability and continuity requirements. Note--Operationally, while accuracy and integrity requirements are being met, a supplemental-

means system can be used without any cross-check with the primary-means system. Any navigation system approved for supplemental means could involve one (stand-alone installation) or several sensors, possibly of different types (multi-sensor installation).

Surveillance - The observation of an area or space for the purpose of determining the position and movements of craft or vehicles in that area or space.

Surveying - The act of making observations to determine the size and shape, the absolute and/or relative position of points on, above, or below the Earth's surface, the length and direction of a line, the Earth's gravity field, length of the day, etc.

Terminal - A phase of navigation covering operations required to initiate or terminate a planned mission or function at appropriate facilities. For airborne missions, the terminal phase is used to describe airspace in which approach control service or airport traffic control service is provided.

Terminal Area - A general term used to describe airspace in which approach control service or airport traffic control service is provided.

Theta - Bearing or direction to a fixed point to define a line of position.

Time Interval - The duration of a segment of time without reference to where the time interval begins or ends.

TOPEX/POSEIDON - TOPographic EXperiment/POSEIDON mission, a joint U.S./French oceanic mapping mission launched in August 1992.

Total System Error (TSE) - The TSE comprises both the aircraft and its navigation system tracking errors. It is the difference between true position and desired position. This error is equal to the vector sum of the path steering error, path definition error, and position estimation error.

Universal Transverse Mercator (UTM) Grid - A rectangular grid of east-west and north-south lines, with linear scale of 0.9996 along the central meridian, and based on the Transverse Mercator projection; mostly used on military maps and charts from 84oN and 80^{o}S latitudes.

Vehicle Location Monitoring - A service provided to maintain the orderly and safe movement of platforms or vehicles. It encompasses the systematic observation of airspace, surface and subsurface areas by electronic, visual or other means to locate, identify, and control the movement of platforms or vehicles.

World Geodetic System (WGS) - A consistent set of constants and parameters describing the Earth's geometric and physical size and shape, gravity potential and field, and theoretical normal gravity.